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Fuel to speed "cube rule" not as good as thought

A study by 3 academic researchers found that the well-known cube rule for fuel consumption to speed does not work unless you are near the design speed

Everybody in shipping 'knows' the cubic rule for how fuel consumption varies with speed. Double the speed and the fuel consumption goes up 8 times, triple the speed and fuel consumption goes up 27 times – and the same with small increments of speed. The lesson is that lowering the speed a little means lowering fuel consumption a lot.

The trouble with this rule is that it does not match real life, according to work by researchers at Norwegian School of Economics, Kedge Business School and University of Nantes (see link below).

The researchers looked at the speed consumption relationship based on 11,000 noon reports for 6 suezmax and 10 Aframax oil tankers on global trade.

The noon reports contain data about daily fuel consumption, voyage data and prevailing weather conditions at noon every day the vessel is sailing, compiled by people (not machines).

The study found that the 'cube rule' is only true near the design speed, but at slower speeds, the fuel consumption has a more linear relationship with the speed.

This calls into question the benefits of "slow steaming" and fuel levies, to encourage vessels to go slower, the authors say.

Companies do not usually have a good model of the vessels' fuel consumption as a function of sailing speed, which they would need to work out the best speed economically.

Today, it is very common for vessels to operate at much lower than the design speed.

In October 2019 Clarkson Research reported reductions in average fleet speeds of 16% for bulkers, 18% for tankers and 24% for containership compared to 2008.

The researchers propose use of a new variable "speed elasticity" which changes with vessel speed, and is estimated from real data from vessel operations, taking weather into account.

This speed elasticity should also take into account draft, trim, sea current, wave, wind and its interaction with the ship heading, they say.

The "findings can also be used to challenge the general political view that a large reduction in CO2 emissions can be achieved through further speed reduction and that an increase in fuel price (through for instance the implementation of a bunker levy) would force ship operators to reduce speed and therefore CO2 emissions," they say.

The full paper can be downloaded free here

https://www.sciencedirect.com/science/article/pii/S1366554520306232#!

TO

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DNV GL's CEO expects a renaissance of the maritime industry

Knut Ørbeck-Nilssen, CEO of DNV GL, says he expects to see the maritime industry go through a renaissance - a period of change but also marked by a revival of classical ideas

The Renaissance period of European history at the end of the Middle Ages was a time of "challenging everything we did, and coming up with a lot of new ideas and innovations, in science, art, culture and all aspects and walks of life" – but also "rediscovering some old and ancient knowledges," says Knut Ørbeck-Nilssen, CEO of DNV GL

The maritime industry may be going through a similar period.

There are three "tectonic shifts" transforming today's maritime world – unpredictable markets, complex regulatory landscape and "turbocharged digitalisation and innovation," he said.

While people have been talking about them for at least three years, some of these themes have become "more tectonic" during the Covid period, he said.

"The global pandemic has challenged the status quo of how we operate, how we do things, the way we all thought was the only truth for how to operate."

Covid-19 "has probably accelerated the digital developments of the maritime industry by half a decade," he said.

"There are many examples where the mentality of people working in the maritime industry has really changed. We are much more open to digital ways of working – and digital ways of interacting."

For example, there has been a 33 per cent increase in remote surveys "since the pandemic took grasp on the world."

"We see a number of shipowners and managers are investing in increased bandwidth, which makes it easier to conduct this."

Machinery maintenance inspections would previously be done with a surveyor looking at logs and spreadsheets, which could take "a number of days if not weeks" to review a 50 vessel fleet. But now, he says, it can be done in 4 hours.

80 per cent of customers are booking surveys using a digital tool.

DNV GL does not envisage that all surveys will ever be remote – it comes to finding the right balance between remote and physical surveys.

There is a value to having surveyors onboard, if they can "detect and understand a lot of the context on the vessel" – which is not achieved if they are sitting somewhere far away telling somebody onboard what to point a camera at. "So yes – I do think attending surveys will be necessary," he said.

Remote inspection also enables access to a wider pool of experts, and so leads to an improved customer experience.

DNV GL calculates that 50 per cent of everything it does in total is remote these days, said Luca Crisciotti, CEO DNV GL , business assurance.

Another change during the Covid period was that DNV GL's webinars were attracting up to 3,000 participants, which previously may have attracted 300, Mr Ørbeck-Nilssen said.

In February 2020 DNV GL launched an online product "FuelBoss" as an "online hub for LNG bunkering", taking customers from order to delivery, handling nominating suppliers, scheduling, spot enquiries and business intelligence.

One area of digital technology where Mr Ørbeck-Nilssen expects perhaps less progress than many industry observers is in fully autonomous, unmanned vessels. While there may be some unmanned vessels, we are more likely to see manned vessels with higher degrees of automation, he believes.

We will need to find the right "equilibrium position", with the right number of crew onboard, and the right level of automation onboard.

Mr Ørbeck-Nilssen believes there is a "great" opportunity for maritime industries in AI.

One example is automated analysis of video footage, including footage taken by drone. This might lead to finding ways to improve safety, maintenance decisions and scheduling.

DNV is looking for ways to "really drive the digital development of the maritime world forward," he said.

Lower carbon fuels

A big change which is unrelated to the pandemic is the move to lower CO2 fuels.

Gas power is an important stepping stone, Mr Ørbeck-Nilssen says. "It all really starts with gas. Gas is the best fuel choice for the next 1-2 vessel generations. Not because gas is the ideal or the perfect solution – but it is readily available, it is there, tested, it demonstrates very significant reduction on greenhouse gas of 15 to 20 per cent depending on what sort of solution you choose."

Knut Ørbeck-Nilssen, CEO of DNV GL

"It is also a very efficient bridging technology towards other fuels and better fuels, which are not ready, but where further research and development, testing, piloting, will lead us on a path where we can introduce these fuels."

"We shouldn't wait for the ideal solution. We should take steps now to improve the climate, reduce emissions, and not least in order to improve our position with the wider stakeholder groups, not least the younger generation. Gas is there, it's ready, there's no reason to wait for alternatives."

"The costs of installing these dual fuel systems will come down with scaling [economies of scale as the industry gets bigger. The more momentum we can achieve, the better for everybody."

But meanwhile, "all of us, not only here at DNV GL but in the entire industry, need to be open to new ideas, work an exploratory mindset, in order to release the potential of this decade and the next decade."

It is already possible to see potential "pathways" of new fuels to be phased in, both for LNG and LPG fuel.

For vessels on so called "tramp shipping", where the sizes and routes are less predetermined, LPG pathways may be more appropriate, because it is easier to store and more available around the world.

In answer to a question from a journalist, Mr Ørbeck-Nilssen acknowledged that some people are pushing only for zero carbon fuels, saying that LNG vessels could become 'stranded assets' in this zero carbon world, but said he "strongly disagreed".

It is like saying the shipping industry should do nothing for the next 30 years while it waits for these zero carbon fuels and continue making emissions the whole time.

"If you can save 15 to 20 per cent [of CO2 emission] by doing something now, or wait another 30 years for something that can save you 50 per cent, I think there's no reason to wait.

DNV GL made its first rules for dual fuel engines (which can run on both gas and diesel) 20 years ago. "It took a long time to develop LNG as fuel – and later on, more general gas as fuel," he said.

Zero carbon fuels like ammonia "are very immature at this stage", he said. "I am not saying we shouldn't do R+D, I'm not saying we shouldn't pilot and test. We can use the short sea shipping segment as a very capable testing ground for some of these new fuels.

The methane slip, where a tiny amount of unburned methane leaks through the engine to the exhaust, is often used as an argument against moving to gas fuel. But there is a lot of work going on to improve this, he said. "I think we can really address that in a good way."

The COVID pandemic has probably caused some delay to some of the decarbonisation efforts, it would be "pretty naïve" to say otherwise, he said. For example, IMO is not able to continue its normal meeting plan.

Mr Ørbeck-Nilssen thinks that the International Chamber of Shipping proposal to IMO that money is put aside for research on decarbonising shipping is "a very good idea".

The funding could look into how different fuels can be used – the safety applications , materials choices, required infrastructure, bunkering systems, any operational risks. The research funding can also be used for pilot tests.

For example, we can learn more about use of batteries onboard, including safety and recharging issues.

Maritime's personal relationships

A major strength of the maritime industry, compared to other industries, is the focus on personal relationships, Mr Ørbeck-Nilssen said.

There are other industries which are very bureaucratic in comparison. "you can hardly meet for a cup of coffee."

"Relations with individuals is really bringing forward a lot of excellent ideas, and a great way of working together," he said.

"You find the maritime exchange is extremely fruitful and that is definitely a learning point."

This extends to the value the maritime industry gets from physical events. One of the benefits of physical events is that people can learn things or meet people they didn't know they needed to know about or meet.

"That is the beauty of human interaction in general – and that will be important going forward," he said.

Infection prevention program

In a separate development, DNV GL has launched a certification scheme for vessels' inspection prevention programs, "Certification for infectious prevention in maritime industries" (CIP-M). The program was first developed in 2019, before the Covid pandemic.

Genting Cruise Lines has already committed to using the program on its 1856 passenger vessel Explorer Dream. There is also interest in the program from passenger and "ropax" (roll on, roll off / passenger) vessels. It could be an important measure in building customer confidence back in the cruise sector, Mr Ørbeck-Nilssen says.

It draws expertise from a (non-maritime) healthcare division of DNV GL, which accredits hospitals worldwide. The company employs many medical experts – former doctors and nurses.

A big challenge when designing the program was combining the different worlds – of hospitals and maritime. The aim was to have a program which would be "hospital grade" but also maritime specific.

The emphasis is on preventing infection. There are estimated to be 1.7m infections every year in US hospitals, and 100,000 premature deaths as a result. "You can realise how important it is to deal with such things," says Luca Crisciotti, CEO DNV GL , business assurance.

The certification scheme covers how well companies monitor the risk of infection, and are ready to mitigate an outbreak if it happens. Mitigation methods include PPE (for crewmembers and passengers in some cases), physical distancing, food preparation, emergency response plans, pre-boarding checks and itinerary optimisation.

The certification document has sections on medical staff, case management, general staff management, rights of infirmary patients, medical records, physical environment, infection prevention and control system, quality management and project management.

It is possible that having a certification scheme for infection management programs on ships could become mandatory, such as with minimum requirements by a flag state through IMO.

Cruise ships can have as many people onboard as in a small town, and numerous passenger and crew changes, so mitigating the spread of infection can be highly complex. There are many elements in common between cruise ships and hospitals, in that they involve giving people beds and food.

But the return on investment for such a program could be enormous if it brings back confidence from passengers in going on cruise ships.

The system can be scaled down in complexity for tankers. The cost of complying with the program is proportionate to the complexity of the operation.

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ENC accuracy – and a grounding

A report by BSU into a chemical tanker grounding gives interesting insight into the importance of understanding the accuracy of electronic chart data

A report by the Germany Federal Bureau of Maritime Casualty Investigation (BSU) of the grounding of 42,000 dwt chemical tanker PAZIFIK in Indonesia in July 2018, published in January 2020, gives interesting insights into the importance of crew understanding the quality of official electronic navigation chart (ENC) data accuracy.

The root cause of the accident could be described as the vessel hitting a rock. The rock was shown on the ECDIS display with a note "underwater rock (always underwater / submerged 1 MAR 2017)".

From this, they assumed that the rock was not a hazard, since surrounding water was a comfortable 100m depth.

The crew also thought the vessel was at a safe distance from the underwater rock, since the electronic chart display had a "cross track distance" of 182m either side of the vessel, and the rock was much further away than 182m, according to the ECDIS display.

(The cross track distance is a system on ECDIS displays where vessels are given a safe corridor shown by red and green lines, rather than a specific course, taking uncertainty into account).

But in reality the rock was only 9m below the water surface, and located 400m away from where it was stated to be on the ENC. The ENC's stated accuracy was +/- 500m.

The rock's location was also shown accurately on a small scale paper chart mapped in a 1904 Dutch survey, and warnings were published in "Sailing Directions" available onboard. BSU heard from local sources that several other ships have ran aground on the same rock.

The route chosen was recommended by the vessel's passage planning software. The vessel's master was familiar with a route through the Lombok Strait, which would have added 200 nautical miles to the voyage. He decided to take the route recommended by the software to save the 200nm, the Selat Snape strait between Komodo and Banta.

The vessel was loaded with 18,000 tonnes of ammonia – although no cargo escaped because only the forepeak / ballast water tanks were damaged.

It was able to refloat 5 days later after transferring cargo and ballast water to other tanks, and could proceed to a shipyard in Singapore under its own power, supported by a tug. The repair included renewing 50m of the double bottom.

The company has decided that the vessel will avoid the Selat Sape passage from now on.

Navigation background

In its original plan (which was changed due to fishing vessels), the vessel had planned to pass the rock at a distance of 0.7 nautical miles (1300m).

Its ENC was classified as "Zone of Confidence Category C", which means a position accuracy of +/- 500m horizontally, and "full area search not achieved".

But the ECDIS was set to a cross track distance of 0.1nm (180m) on each side.

This fits company procedures, where it recommends to keep a "cross track distance setting" of 2 x the vessel's beam in confined waters, or just 64.4m, and this passage is considered "confined waters" in the procedural specifications, so the 0.1m (180m) cross track was considered within limits.

There could have been an alarm in the ECDIS that the cross track was set to 180m, while the chart had an accuracy of 500m.

The crew could have brought up data about the chart accuracy on the ECDIS display, including both horizontal and vertical accuracy, such as for submerged rocks. But it was quite hard to understand how to use it, BSU says.

If the vessel had been navigating with paper charts, the crew would probably have been more considerate of possible inaccuracies in the chart, and looked up all the "Sailing Directions" if the vessel was going to an area the master was not familiar with.

Or concerns about using paper charts in an unknown area may have led the crew to take on a pilot, who may have had his own accurate soundings map, or had better local knowledge, BSU said.

Sailing directions

The relevant section of Sailing Directions for the strait between Komodo and Banta states "The passage E of Pulau Banta is navigable but is seldom used, other than by ferries and other local craft, as tidal streams are strong and fewer anchorages are available."

The Sailing Direction for the island of Tokohgilibanta states, "a drying rock, 1 mile farther NNW, is small and dangerous; the breakers on it being indistinguishable from the normal overalls and sea conditions in the area." (Confusingly, on the ENC, the name of the island changes from Tokohgilibanta to Nisabedi when the viewer zooms in). This description reflects the location of the rock where the vessel ran aground.

A digital version of these sailing directions would have been available onboard, but without any reference to the ENC, which would be required for the computer to connect them.

BSU says that the ECDIS could be described as "not fully engineered" - since it displaces sources of information such as paper sailing directions, without being a consistent replacement for them.

"There are significant differences between traditional voyage planning using paper charts and digital voyage planning using ENCs. Planning a voyage using paper charts often entails referring to sailing directions, the list of lights and pilot charts with proposed routes plotted."

"Besides drawing on their experience, officers of the navigational watch therefore refer to sources of data other than the navigational chart. Paper charts and sailing directions have developed over centuries and became more accurate in many areas."

"Most of the world's sea areas are looked upon as being inaccurately surveyed, while paper charts only provide an indication of the data of a survey."

"The accident is therefore attributable to the ECDIS and settings specified," BSU says.

More details

The vessel ran aground on a shoal between the islands of Komodo and Banta, Indonesia.

It was using a Transas ECDIS, with PassageManager software from ChartCo, with ENCs supplied by ChartCo using data from the Indonesian Hydrographic Office. It was using voyage planning software "BonVoyage System" (BVS) from StormGeo.

The ChartCo software proposed a route via Selat Sape, passing between Banta and Komodo, going between the tiny islands of Nisabedi and Lubuhtare, which have only 1.5nm between them. The master and officer decided not to take this route, but instead take a route between the islands of Nisabedi and Banta, which have 2.5nm between them.

BSU looked at the Indonesian and UK Hydrographic paper charts of the region. The UKHO charts (both 1:500,000) show a "rock awash" symbol, meaning a rock submerged at high tide or temporarily.

The Indonesian smaller scale chart (1:200,000) shows a rock symbol without specifying whether it is sometimes submerged, while the larger scale Indonesian chart (1:50,000) shows a shallow area with water depth of 9m. This chart was drawn from Dutch surveys carried out in 1904.

The ENC shows the shoal 2 cable lengths (400m) from the scene of the accident, with a note saying, "underwater rock (always underwater / submerged 1 MAR 2017)". The general water depth around the rock is about 100m.

The reason for the discrepancy between the ENC and paper chart is not clear.

The ENC has a "Zone of Confidence Category C" (CATZOC) which means "a position accuracy of +/- 500m horizontally, and "full area search not achieved". This data could be fed into the ECDIS to illustrate the range of "cross track distance" needed.

IHO has a Data Quality Working Group looking at options for improve user awareness and presentation of quality data.

The full report is online at **https://www.bsu-bund.de/SharedDocs/pdf/EN/Investigation_Report/2020/Investigation_Report_241_18.pdf?__blob=publicationFile&v=3 ==**

Or Google "Investigation Report 241/8"

OCIMF / ICS publish ISGOTT 6

An updated edition of the International Safety Guide for Oil Tankers and Terminals (ISGOTT) has been published by OCIMF and ICS, including substantial amendments to the enclosed space entry section

The International Chamber of Shipping (ICS) and The Oil Companies International Marine Forum (OCIMF), in conjunction with the International Association of Ports and Harbors (IAPH) have published an updated edition of the International Safety Guide for Oil Tankers and Terminals (ISGOTT).

A particularly large change has been made to the section on enclosed space entry, "which continues to be an issue of significant risk on board tankers and at terminal facilities," OCIMF says.

This section addresses gas detection, the toxicity and the toxic effects of petroleum products (including benzene and hydrogen sulphide), the generation of static electricity and stray currents, fire protection and the growing use of mobile electronic technology.

Emphasis has been placed on reflecting changes in the understanding of the impact of human factors in tanker and terminal operations and ensuring that the recommendations in ISGOTT are included in Safety Management Systems (SMSs) and procedures.

Other key areas which have been updated include marine terminal administration and the critical importance of the tanker/terminal interface, alternative and emerging technologies, and bunkering operations, including the use of alternative fuels such as Liquefied Natural Gas (LNG).

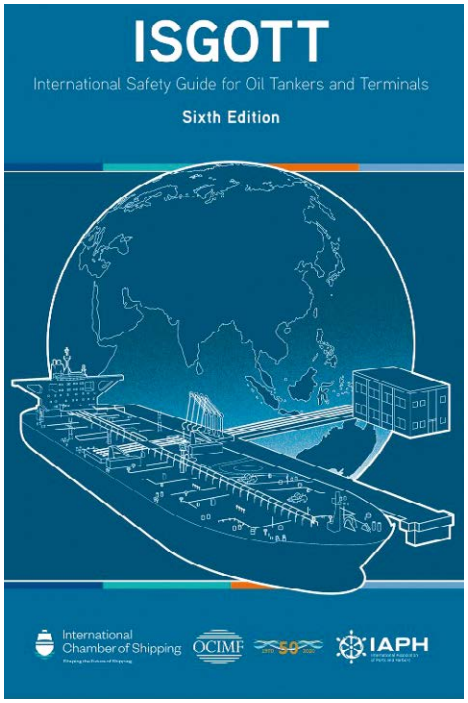
The text aims to reflect current best practices and legislation, and to ensure ease-of-use by personnel on board and ashore.

The Ship/Shore Safety and Bunkering Operations Checklists contained within the publication have been released for free download.

This enables responsibilities for tanker and terminal to be easily communicated before arrival, and when alongside.

ISGOTT is also aligned with OCIMF's recently revised Mooring Equipment Guidelines. There is information covering maritime security, linking to the International Ship and Port Facility Security Code (ISPS) and industry's maritime security Best Management Practices (BMP).

Support has been provided by other industry associations including the International Association of Independent Tanker Owners (INTERTANKO), the Society for Gas as a Marine Fuel (SGMF), the Society of International Gas Tanker and Terminal Operators (SIGTTO).



The previous (fifth) edition of ISGOTT was published in 2006.

The book and e-book are available to purchase from Witherby Publishing Group here **https://www.witherbyseamanship.com/isgott-6th-edition-international-safety-guide-for-oil-tankers-and-terminals.html**

The Ship/Shore Safety and Bunkering Operations Checklists can be downloaded from OCIMF's website, here **https://www.ocimf.org/publications/books/international-safety-guide-for-tankers-and-terminals-(isgott-6).aspx**

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Columbia – supporting seafarer mental health

Columbia Shipmanagement is providing seafarers and office staff with access to a remote counselling service – and also recognising the importance that good technical management, and good social life onboard, can have to how seafarers feel in these difficult times

Columbia Shipmanagement, one of the world's largest ship management companies, based in Cyprus, is providing its seafarers and office staff with a free 24 hour remote counselling service, where they can talk through any worries they have, and also mental health concerns.

More broadly, the company recognises there are many factors which can support good seafarer mental wellbeing, including a strong company culture, good organisation, communications with senior managers, as well as good nutrition and focus for socialising onboard.

Counselling service

The counselling service is provided by a Hamburg based company called Mental Health Support and Solutions (MHSS), which specialises in maritime mental health. Seafarers can use the service 24 hours a day, talking to a counsellor via phone, e-mail or WhatsApp.

The service is offered free of charge to all shipboard and offshore personnel. Support is also available in common seafarer languages, via a network of psychologists.

Posters have been placed on ships encouraging people to use the hotline, with messages such as "you are not alone, we are here for you."

Videos have been created for the crew explaining what the service is for and how they can take advantage of it.

Providing access to a counsellor is something fairly new for seafarers, says Captain Faouzi Fradi, group Director of Training at Columbia. People have had access to remote medical advice for many years, but that is not the same thing.

In many cases, having someone to talk to about an issue is the most useful part of the service, says Charles Watkins, clinical psychologist with MHSS.

People do not need to give their name or the name of the vessel. They can be provided with mental health tips, or a counsellor can talk through their feelings and explain that they are normal.

Seafarers can be asked what would make them feel better. They can be encouraged to speak to family and friends, and also consider if there is someone who has helped them in the past, in a relationship which can be reactivated. "Encouraging them to talk to someone is the best advice," Mr Watkins says.

Seafarers might be encouraged to connect more with people onboard. Sometimes the availability of internet communication can discourage people onboard from talking to each other. The counselling can re-emphasise the value of face to face communication, he says.

One of the toughest aspects of the Covid period was difficulties changing seafarers on a vessel, which meant that many seafarers were staying onboard longer than they had anticipated. "You were looking forward to going home on a certain date and now it is pushed back. Having a stay prolonged is one of the hardest issues for seafarers to handle," Captain Fradi says.

While the company may not be able to do much when crew are unable to leave a vessel, the counselling service can help. "It is about having the possibility to talk about these things – the anger, sadness, depression, having the ability to get it all out," Mr Watkins says.

"It is about understanding where these things may come from, helping them get a grasp of what is going on. It is helping them to normalise, bring helpful tips that they may not have thought of."

Suicide

One of the toughest issues to deal with onboard is when someone is thought to be a suicide risk.

In this case, whoever has the concerns is able to contact the counselling service to talk it through.

It is easy to handle the situation in the wrong way at both extremes, Mr Watkins says. Sometimes such behaviour is thought of as a short-lived emotional outburst which does not warrant further concern. At the other extreme, masters may take drastic action to prevent

someone from having any capability to harm themselves.

If the issue is discussed with a counsellor, "it is a type of crisis management. There's a lot of different scenarios," Mr Watkins says.

"You need to assess if there is a current danger of someone harming themselves, or maybe you just need to take a tactical step, removing sharp objects from the person's reach."

"Once the captain realises there's a threat, we work closely together to make sure the person is getting every help they can."

Socialising onboard

As a former captain, Captain Fradi says he still misses the environment and ambience onboard. Apart of the heavy workload it can be very relaxing as well, with people having plenty of time to themselves, he says.

On large tankers particularly, "the accommodation space is comfortable and cabins are good. The standards in the whole industry have improved significantly."

But alcohol, which in former times would have been a good social lubricant, is typically banned or highly restricted on vessels today.

As a replacement for providing a social focus, shipping companies often provide gym or sport equipment. Providing better food, and running cooking competitions, also gives crew a focus for socialising,

Columbia works with Christian Ioannou, Managing Director of an international maritime catering management and training consultancy called MCTC, which both supplies food and provides training for cooks onboard.

"Things like cooking contests, or newsletters that seafarers write, [support] open communication where ideas are shared," Mr Watkins says.

"The culture is lived through how you communicate, the ability to know what everyone is doing. Everyone is on the same page. Everyone feels appreciated and valued."

A better social atmosphere onboard also means that seafarers are more likely to spot if someone else is having mental health difficulties. "It is hard to see psychological problems if people don't talk to each other," Captain Fradi says.

Four pillars

More broadly, Captain Fradi sees four "pillars" for maintaining a healthy atmosphere onboard - good technical management, supporting wellbeing onboard, support for mental health (described above), and training.

In terms of good technical management, seafarers are happier in general if there are robust management systems and procedures, all the necessary spare parts are available, and there is a well-regulated onboard routine, which people can get used to. Seafarers can get familiar with the company policies, and understand how they fit the company culture.

The training provided to seafarers includes advising people on how to help their own mental health. "We have sent a lot of training materials, in the form of videos and computer based training, to all our seafarers to prepare them for this [Covid] crisis," he says.

Communication with the company is very useful. The company president personally makes short videos every week, separately for seafarers and office staff, giving them an update on the global situation and what Columbia is doing to help make crew changes. One video had over 30,000 views, Captain Fradi says. "This was extremely helpful for the whole staff to get through this pandemic."

All company top management and directors regularly call ships for a chat with the master, and other staff are also encouraged to talk to the crew.

"Communication will be the key word in this crisis."

TO

How COVID changed work at Thome

We spoke to Olav Nortun, CEO of Thome Ship Management, about how COVID changed working life – including challenges of seafarer travel, remote working and remote inspections

The biggest challenge the shipping industry faced during the Covid period was getting crew onboard and released from vessels and back home, says Olav Nortun, CEO of Thome Ship Management.

Challenges included ensuring they were not infected on the journey to the ship, testing, quarantine, getting visas, finding flights.

As of June 2020, the situation did not seem to be getting any better. Many seafarers were patiently waiting for changes in restrictions, so they could sign off, he says.

Authorities didn't seem to realise that vessels can be very safe places to be from a virus perspective, so long as nobody onboard has it, he says.

Governments around the world could have done more to facilitate crew changes. They may face consequences from their voters if they don't fix it, he says. "If the ships can't sail, every household would feel it eventually, and sooner rather than later."

Dry docking has also been complicated. There have been difficulties sending superintendents to supervise. The company has arranged more dry dockings in China which previously would have been done in other parts of the world. "That turned out quite well, it has been a surprise."

Planning port stays has more complications, with the need to arrange for people, spares and stores to be delivered at the right time – or find alternatives when normal supplies are not available.

There have also been challenges finding stores and spares, he says.

On the plus side, Mr Nortun has observed improvements in the safety statistics during the Covid period. It seems that all the talk about viruses is making people take more care in other areas.

Covid precautions can make port activities can take more time, but that has a positive influence on the environment onboard, it can be less stressed, he says.

Digital tools

During Covid, the actual process of work did not change, but it was done with new tools, he says.

The company kept only a skeleton staff in its main office in Singapore, while the India office was closed completely, with everyone at home.

When people in the company first realised they would be doing everything from home, "it was a scary moment", he says. But "Most companies and corporations have been surprised how well it has gone. We learned to use the tools we have."

Some staff have warmed to digital ways of working faster than others, but it isn't necessarily the younger ones who warmed to it faster. "I don't see any difference on age actually. It is more about the type of work you do."

For example, there are many technical staff who usually spend most of their lives travelling, and are already used to remote working. "The others were not so prepared for it. But it didn't take that long time, a couple of weeks, and they were on their way."

When people use more video conferencing rather than telephone or e-mail, "we can see the faces, expressions, if they have a good day or they're a bit down. Then we can see how we can get them up. That's been a great success."

Some people have been more curious than others to learn how to use digital tools, exploring the systems and see what opportunities they give. They can see the benefits of uploading documents to cloud servers rather than e-mailing them. These are the sorts of people who show curiosity in their normal office work, he says.

"There's a lot of what I call incremental development, that is possible here, maybe possible there."

The company developed its own software platform "Plan Smart" to help plan port stays, keeping everyone up to date with the current situation, so there was less need to chase people with e-mails, he says.

All of the information for purchasing and finances, can be made available in the software. "It is easy to see, to share it."

Working with vessels remotely

The same technology – Microsoft Teams – is

Olav Nortun, CEO of Thome Ship Management

used for communicating with the vessel and communicating between office based staff.

Shore staff are in regular contact with the crew to check they are OK, and hold some scheduled meetings.

Mr Nortun has personally had three "meetings" with vessels, while one was sailing across the Indian Ocean, one was waiting for a port berth outside Indonesia, and one was in the Middle East. It is an opportunity to see the maintenance schedules, the conditions onboard, and see how crew are feeling.

Microsoft Teams is also used to communicate with seafarers who are about to sign onto a vessel, but currently at home, providing updates on what is going on, and opportunities to ask questions. This may be a useful habit for the long term, but "it wouldn't have happened without Covid," he says.

The company does its internal audits remotely. This offers a useful opportunity to keep up with the vessel in a number of ways, such as checking how the maintenance is going, and what activities are going on, including training.

Thome is also expanding its use of remote external audits, including ISM and class inspections.

Most industry processes are set up so that people need to be present physically in some form, so it requires some change, he says.

ISM remote audits probably would never have happened without Covid. "These are things I believe will stay," he says .

A benefit of virtual inspections over physical inspections is that they can be done when the vessel is at sea, rather than being done during port calls, which is already the most hectic time for vessels.

"Class is coming onboard, port state is coming onboard, SIRE inspector is there, everybody is coming at the same time, we're doing bunkering."

Virtual inspections while the vessel is at sea are not stressed in time. It means the seafarers are under less stress.

Habits after Covid

Mr Nortun hopes that some of these new practises will continue after Covid.

"None of the things we do today we couldn't do before Covid. But we were forced. Now, there's no reason not to continue with it, it is better for everybody," he says.

The remote working could go further. For example, there could be less face to face meetings with suppliers, and equipment suppliers could provide more remote assistance.

Home working could be more acceptable where getting to the office is a burden.

However, Mr Nortun says he misses the social aspects of the office. "I do miss this interaction, of course I miss the interaction. There are things that are better done eye to eye than on a screen, particularly on the creativity side."

And our homes are not usually the most comfortable place to work. "I'm sitting in a spare bedroom to work today, that's where I spent the last month. I get it to work, but it isn't made for work," he says.

Management is different when it is done remotely, because it is not so easy to have casual chats with people, as you might have in the office.

About Thome

Thome Group supplies integrated ship management services to the shipping and offshore sectors.

The company manages tankers, gas carriers, bulk carriers and container vessels. It has management of 385 vessels altogether (full managed plus crew managed) and a total crew pool of over 11,000 seafarers.

Mr Nortun was appointed as CEO of Thome in April 2015, formerly executive VP of classification with DNV GL.

EM&I – laser scanning could replace tank entry

Asset integrity management company EM&I is developing laser scanning methods for tanks on offshore vessels, which could remove the need for people to enter tanks to do inspections

Asset integrity management company EM&I is developing automated methods to inspect tanks on offshore vessels using laser scanning, so there is no need for people to enter tanks.

Tank inspection is considered by many to be one of the most dangerous tasks which FPSO and tanker crew undertake, with a number of accidents reported on tankers. The spaces can be difficult to enter and exit. If crew have any accident or medical issue while in a tank, it can be difficult to summon help.

The solution developed by a Joint Industry Project (JIP) led by EM&I uses laser scanning at a distance, instead of close up inspection by people.

A laser beam is fired in multiple directions, and bounces back to a sensor next to the camera, enabling the computer to build up a 3D image of what the laser can "see", using multiple points (known as a "point cloud").

The same technology is used to make 3D models of equipment, and also for navigation of autonomous cars.

The device does not have to be taken into the tank by a person, if the laser can be shot into the tank through a hole in the deck or an opposite wall.

Working with digital imagery taken remotely is something that the nuclear industry has done for a while,

A typical scan takes about 8 minutes, where it could take several days with people in the tank for a traditional tank inspection, he says.

With laser scanning, it would be possible to inspect all the tanks on an FPSO with 2-3 people "in a few days" – rather than having 10-12 people onboard for 3-4 weeks, doing dangerous work which involves going into tanks, as it is done today.

An alternative option to shooting the laser through a hole is to have the laser scanner mounted on a robot vehicle inside the tank. To guide the vehicle, railway type tracks would be fitted inside the tank, for example with rails a foot wide and 20 feet long. The laser could be installed onto a robot with wheels, which is lowered into the tank onto the tracks. This is probably a solution more for a new vessel than a retrofit, says Danny Constantinis, chairman of EM&I.

EMI considered drone mounted lasers inside a tank, but it proved to be not a very workable approach – it would still need someone in the tank to drive them. Also, the laser needs to be very static to take a good survey, so would be better sitting on something more solid than a drone.

Early laser trials were held in 2019 on an FPSO in Equatorial Guinea under the HITS JIP programme managed by EM&I.

EMI is seeking more projects with oil majors and class societies to further improve the technology. It should be ready for full commercial launch in late 2020 or early 2021.

How it works

Laser scanning technology has advanced greatly in the past few years, and it is now possible to "see" in enormous resolution. A laser scan shows up distortion in the steel, rusty patches and paint breaking down. Laser scanning can reveal pits in steel due to corrosion, and areas where the steel is thinning or corroding. The data can also be converted into stress models, to identify where the weak areas are.

A big challenge when evaluating tanks is measuring the thickness of the steel (and if it has been thinned through corrosion). People used to tap the steel with a hammer, or by using a calliper (if they can access both sides of the steel), or ultrasonic technology – but all of this involves someone entering the tank.

EMI is developing a technique using "synchronous lasers", when you do laser imaging from different positions in the tank, and then put the images together. This can be used to evaluate thickness if you can 'see' both sides of the steel with a laser and also relate the two laser positions.

If you can only see one side of a tank wall with the laser, one approach to measuring steel thickness is to use datum points, such as a point on the tank wall which can also be seen from outside the tank (such as an access point). You can use this datum point to connect together multiple images.

A similar technique is used in building construction to ensure (for example) different sections of piping connect together. Two pipe sections can be designed to connect at a 'virtual' datum point.

"We can measure the thickness as accurately as if a man was in there," Mr Constantinis says.

Software can handle basic quality control over the data collection, so as to confirm that all of the tank area has been surveyed.

The laser data can be collected by a few specialist technicians and analysed by surveyors and engineers from their desks.

The remote surveyor could also review data while the survey is happening, and request that certain areas of the tank are given special attention.

EMI worked together with statistics experts to assess how much data is actually needed to get a high level of reliability in the predictions.

Automated tank cleaning

The next research project may be to look at automated cleaning methods for tanks. The challenge is to find a way to remove the liquid sediment which falls to the bottom of the tank.

The initial efforts are based around looking for technological ways to determine which parts of the tank justify most cleaning effort.

"We've tried different [automated] technologies to go through the sludge – it can be done but it is very slow, at present but work is progressing to speed things up" Mr Constantinis said.

TO

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Fire system maintenance and laboratories

IMO's guidelines for maintenance and inspections of shipboard fire protection systems include some elements which can be done by qualified personnel onboard the vessel, and some elements which may need to involve a laboratory. Dyne Fire Protection Labs explain

By Grant Lobdell, General Manager, Dyne Fire Protection Labs.

International Maritime Organization (IMO) MSC.1/Circ.1432 Revised Guidelines for the Maintenance and Inspection of Fire Protection Systems and Appliances provide the minimum recommended level of maintenance inspection for fire protection systems and appliances.

While some of these guidelines are intended to be done by qualified personnel on board the vessel, others may require outside facilities/ equipment.

In some cases, a laboratory may need to be involved to evaluate the fire protection equipment/chemicals.

The following sections from the standard reference testing that a laboratory may be best suited for.

Annual testing and inspections

7.4.9 Take samples from all foam concentrates carried on board and subject them to the periodical control tests in MSC.1/Circ. 1312 for low expansion foam, or MSC/Circ. 670 for high expansion foam. (NOTE: Except for non-alcohol resistant foam, the first test need not be conducted until 3 years after being supplied to the ship.)

The equipment needed to complete MSC.1/ Circ. 1312 and 670, such as centrifuges and pH meters, are not typically found/maintained at local fire protection servicing facilities.

7.5.7 Test all antifreeze systems for adequate freeze protection.

While it may be possible to infer the freeze point of an antifreeze solution simply based on the refractive index or density of the solution when the type is known (handheld refractometers and density meters are available for field use to aid in this determination), a laboratory would be able to determine the freeze point even when the type isn't known.

7.5.17 Test a minimum of two automatic sprinklers or automatic water mist nozzles for proper operation.

Depending on the Administration's definition of "proper operation", laboratories with specialized test equipment designed solely to evaluate sprinkler sensitivity may be needed.

7.8.1 Check breathing apparatus air recharging systems, if fitted, for air quality.

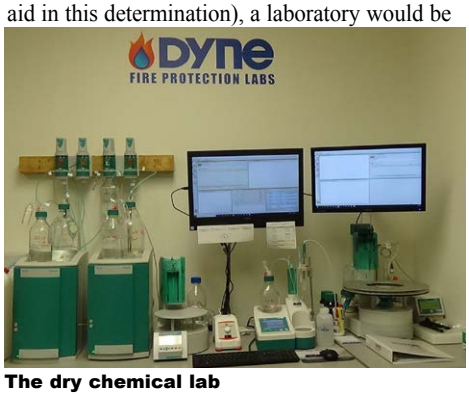
Accurately and precisely determining the concentration of various components of compressed air, such as oxygen and carbon dioxide, typically requires the use of advanced analytical techniques/equipment (chromatography) not typically found at a local fire protection servicing facility.

7.11.4 Protein based foam concentrate portable containers and portable tanks should be thoroughly checked and, if more than five years old, the foam concentrate should be subjected to the periodical foam control tests required in MSC.1/Circ. 1312, or renewed.

The equipment needed to complete MSC.1/ Circ. 1312, such as centrifuges and pH meters, are not typically found/maintained at local fire protection servicing facilities.

7.11.5 The foam concentrates of any non-sealed portable containers and portable tanks, and portable containers and portable tanks where production data is not documented, should be subjected to the periodical foam control tests required in MSC.1/Circ. 1312.

The equipment needed to complete MSC.1/ Circ. 1312, such as centrifuges and pH meters, are not typically found/maintained at local fire protection servicing facilities.



The dry chemical lab

Two-year testing and inspections

8.2.4 Test a sample of dry chemical powder for moisture content.

While some standards do exist that infer moisture content from a physical "drop test" (if the powder breaks apart, it must not be moist), a laboratory would be able to quantify the moisture content with more advanced analytical techniques and compare the moisture content against established requirements.

Examples of standards that outline both an analytical method for quantifying moisture and set limits on that concentration are *BS EN 615 Fire Protection. Fire extinguishing media. Specification for powders (other than class D powders) (current edition: 2009)* *ISO 7202 Fire protection -Fire extinguishing media – Powder (current edition: 2018).*

Five-year service

9.2.4 Test all foam proportioners or other foam mixing devices to confirm that the mixing ratio tolerance is within +30 to -10% of the nominal mixing ratio defined by the system approval.

Once the finished foam solution is collected on board the vessel with the equipment installed, the evaluation of that solution, determining how much foam concentration vs water is in that solution, can be done in the field provided the necessary equipment needed to perform such analysis is available.

The National Fire Protection Association (NFPA) describes how this analysis can be done in both *NFPA 11 Standard for Low-, Medium, and High- Expansion Foam* and *NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems* . More detail can be found in the NFPA 25 Handbook which is also available.

However, if the necessary equipment is not available or increased accuracy and precision are needed, laboratory analysis may be warranted.

About the Author

Grant Lobdell is the General Manager of Dyne Fire Protection Labs. Dyne Fire Protection Labs is a laboratory based out of Woodbury, Minnesota (USA) that specializes in the periodical compliance testing of various fire protection chemicals and devices including firefighting foam, antifreeze solution, fire sprinklers, and dry chemical agent. Grant currently serves as the alternate to the chair of the National Fire Protection Agency (NFPA) 11 Standard for Low-, Medium, and High-Expansion Foam, is a member NFPA's Automatic Sprinkler Fire Protection Research Council and actively participates on the Standard Technical Panel for UL 2901 Antifreeze Solutions for Use in Fire Sprinklers Systems.

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Thinking strategically about tank cleaning

Tanker Operators would benefit from thinking more strategically about tank cleaning, saving money over the longer term in water disposal costs from a slightly bigger upfront investment in cleaning equipment, says Dasic Marine

Ian Rippon, sales manager of tank cleaning equipment company Dasic Marine, cites a customer in the milk industry (not in shipping), which was cleaning its tanks using a basic "spray ball" equipment, capital cost £200, and paying £40k annual water disposal costs.

It purchased a £2,000 cleaning machine tailored to the tank which did the cleaning job in much less time with much less water, reducing the water disposal costs to £800 a year.

Water from milk equipment cleaning contains fats so cannot be disposed of in normal sewage systems.

Tanker operators can be sceptical about the idea that they can learn something from the food processing industry. But the food industry's cleaning needs are very similar to tankers. Cleaning often has to be even more rigorous, to comply with strict hygiene regulations, while also under pressure to reduce costs and increase productivity, Mr Rippon says.

And where a tanker company will typically only buy traditional marine tank cleaning equipment once and then forget about it, a company processing food will upgrade equipment regularly, and expect improvements with each new purchase in terms of cleaning effectiveness, speed and water usage.

Tanker companies, with their excessive work load, do not typically think very strategically about tank cleaning – they will often only ask for new machines when their existing machine breaks due to bad maintenance, or they suddenly realise they need one for a new cargo or voyage to a part of the world with higher tank cleanliness demands, Mr Rippon says.

There are many ways tanker companies could benefit from thinking more carefully about their choice of tank cleaning equipment, he says.

A typical tanker may have 10 cargo tanks but up to 50 tanks in total, with the other 40 being tanks such as sewage, sludge, fuel and fresh water with a wide variety of sizes. But tanker companies will typically use the same large cleaning machine for all of its tanks, where it could use a smaller machine on these tanks and use much less water. Or they will clean tanks by hand, which means "man entry procedures" have to be followed, which is time consuming and potentially very dangerous.

For fuel tanks (smaller than cargo tanks), tanker operators could take advantage of machines developed for cleaning tanks in retail petrol stations that can be used remotely through a 3" opening and are explosion proof. These can clean a fuel tank with much less water than the large machines used for cargo tanks in as little as 10 minutes, he says.

The same machine can be used for sulphur tanks, as they are stainless steel and have chemical resistant seals developed for the chemical process Industry.

One tanker operator would carry fuel oil and jet fuel in the same vessel alternately. You need to do a hard clean after carrying fuel oil. But it would do the same level clean after carrying jet fuel, when it only really needed to do a tank rinse, which could be done with much lighter equipment.

Bunker vessel operators, who may need to give their cargo tanks a thorough clean before dry dock, can reduce costs by using gas oil or kerosene for tank cleaning with 6mm nozzles on the tank cleaning machine to soak the bulk heads and soften the dirt, then change to 10mm nozzles to clean with hot water.

After washing, the kerosene (now mixed with vessel fuel) can be put back into its original container. It can be later sold or blended to fuel the actual bunker vessel. This will halve the amount of water you need for the final tank cleaning and mean much less wastewater contaminated with bunker fuel at the end, which is very expensive to dispose of.

Companies can also reduce tank cleaning costs from having smaller nozzles on board for tank cleaning equipment and using the appropriately sized nozzle. The standard 10mm nozzle might make sense for larger cargo tanks, but a 6mm nozzle would be adequate for smaller tanks, and this would save 10 cubic metres of water an hour, he says.

A smaller nozzle would also be adequate if you are just rinsing a cargo tank rather than cleaning it, as you need to do before putting food into an otherwise clean tank.

Sometimes crew seem to have a psychological attraction to using large nozzles. "You can hear the impact on the side of the tank, that's what they like. If they change to 6mm nozzles, you wouldn't hear it as much but it will still clean as effectively again saving 10 cubic metres of water an hour," he says.

Aside from the water disposal costs, using less water for cleaning also makes a tanker company more environmentally friendly, which is increasingly important for tanker operators.

Working with suppliers

While tanker operators may not have the time to work out themselves which nozzle is right for each task, they can ask their tank cleaning equipment supplier to take on this task, Mr Rippon says.

The tank cleaning equipment supplier can help create procedures showing exactly what equipment and set-up is most appropriate for each tank – typically a 10mm nozzle or cargo Tanks 2,3,4 & 5 and 6mm for 1s). Nozzles can be changed in just a few minutes by the crew. This can be specified in the operating procedures - exactly as the food industry does, he says.

The nozzles can easily be labelled showing which nozzle is most appropriate for which wash type, he says.

A similar service could work for ships, where a cleaning equipment company supplies a kit with different sized tank cleaning machines and nozzles tailored for the vessel or fleet labelled for which tanks they should be used for, or which grade of products. This kit can easily be returned for overhaul and returned to the vessel in a short time frame or circulated around the fleet guaranteeing availability of a tank cleaning machine, reducing the chance of expensive delays while waiting for machines to be repaired or delivered.

Mr Rippon's background after serving at sea with BP and Shell was as a superintendent in tanker operations, first with Clipper Tankers then technical manager with Carisbrooke Shipping and a technical superintendent with Whittaker tankers.

As a sales manager with Dasic, the biggest challenge is often getting a chance to talk to extremely busy superintendents to show how the company can help, he says.

TO

ShipMoney – providing prepayment cards to seafarers

ShipMoney of Fort Lauderdale, Florida, reports a growing interest from shipping companies in providing seafarers with its prepayment Visa cards for use in both business and personal purchases

ShipMoney, based in Fort Lauderdale, Florida, reports that shipping companies are showing an increasing interest in providing seafarers with its pre-paid Visa cards, which can offer both more convenience and less hassle than cash, at no extra cost. Separate cards and accounts can be provided for business and personal payments.

It is not unusual for a ship to need to have $20,000 of cash delivered four times a year, for its business payments and to pay crew – which can be very awkward to manage, says Stuart Ostrow, president and founder of ShipMoney.

The "ShipMoney for Captains" Visa card can be used by captains to pay for provisions, emergency supplies and other ship expenses they may incur at port calls.

Seafarers can use their personal Visa card in the same way as any other Visa card, making payments and withdrawing cash. They can have a plastic contactless payment card, and also use the account to make payments online.

Seafarers can provide spouses at home with a "companion card" to the same account, which can be used to withdraw cash and make payments.

Seafarers can also make cash payments home via Western Union or Moneygram, arranged via a website they can access on their mobile phones. They pay a fee for this though (a typical example 1% on the exchange rate plus a $3 - $10 fee).

For personal payments, many seafarers already have their own bank accounts with cards attached. But these accounts are not necessarily in US dollar domination, and most seafarer employment contracts are in dollars.

This means that if they are paid, the money is converted to the currency of their account and the bank takes a fee for this. It is a completely opaque transaction, Mr Ostrow says. While the shipping company fulfils its contractual obligations by transferring the required dollar amount, nobody gets to see and agree the conversion rate before the money is converted.

With the ShipMoney card, the account is in dollars, and the account shows the same amount which the company transferred.

Making payments can be easier for the shipping company if all the recipients have ShipMoney accounts, because they can take advantage of ShipMoney's automated tools to issue cards and pay funds into multiple accounts.

"A card is just as good as cash in most of the world," Mr Ostrow says. "You're not taking anything away from a crewmember."

The ease of making and managing payments may incentivise companies to make payments more often than monthly – for example weekly or biweekly – which could be a big benefit to seafarers.

Because it is just a pre-paid card not a bank account, seafarers do not have to undergo any complex "know your customer" checks when they are being issued with a card. A shipping company can arrange for all of its crew to be given a card.

The growth in the maritime industry's use of prepaid cards follows the general trend in many countries to move to cashless payments. Covid-19 is also accelerating the move, because it becomes harder to arrange for people to visit vessels to make cash deliveries, and because there are fears that the virus could be carried on paper notes.

Mr Ostrow started Ship Money after a first start up based in the cruise industry, providing companies with an alternative to cash for paying staff. His systems is now used "universally across the cruise industry" he said.

Not a bank

ShipMoney classifies itself as a fintech company, issuing Visa cards backed by funds held by the company in multiple bank accounts. It is not itself a bank, and so it is not subject to complex banking regulation.

"We own and manage the program, and behind the scene are banks that we work with," Mr Ostrow says.

The bank deposits are protected by US FDIC (Federal Deposit Insurance Corporation) up to $250k per account.

Ship Money also manages to increase the insurance cover beyond this limit by splitting deposits to multiple banks. So if a shipping company wants to deposit $10m, the software automatically disperses it into 50 different accounts in the US, so each account only needs hold $250k.

Stuart Ostrow, president and founder of ShipMoney

It is not subject to requirements to share data about transactions with a national regulator, which a bank would be subject to.

The shipping company gets insight into transactions made with business accounts, but personal transactions made by seafarers are private.

All of the deposits are pre-funded – there is no money lending involved.

Ship Money earns its own revenues from card transaction fees paid by vendors – so if a crew member uses the card to pay for a restaurant meal, the restaurant pays a few percent of the transaction as a card fee, and some of that goes back to Ship Money.

Also, if a seafarer wants to do a cash transfer home via MoneyGram or Western Union, Ship Money receives a commission on the cash transfer fee.

In November 2019, ShipMoney launched a new project, "ShipMoney Cares" providing one time grants of $50 to $500 to seafarers and their families "who can demonstrate that they or their family are experiencing some form of hardship that impacts their livelihood or incomes". It will be managed by ISWAN International Seafarers' Welfare and Assistance Network. Funds are donated by ShipMoney and its "strategic remittance partners."

Covid and seafarers

The Nautical Institute held a webinar on June 25 to commemorate the "Day of the Seafarer", with comment from senior staff from InterManager, Anglo Eastern, Princess Cruises, and NI's Ireland branch about the situation with seafarers with Covid

The Nautical Institute held a webinar on June 25 to commemorate the "Day of the Seafarer," with speakers from InterManager, Anglo Eastern, Princess Cruises and the Nautical Institute Ireland branch, commenting on the situation with seafarers in the Covid era.

Captain Nick Nash, former president of the Nautical Institute and currently rotating captain of the newest Princess Cruises vessel "Enchanted Princess", said that the importance of the work of the seafarers is not getting through to wider society.

"We're a silent service making the world go around," he said. "Those Amazon parcels [arrive] because we have people still working there in these difficult conditions."

Jillian Carson-Jackson, president of the Nautical Institute, noted that a Seafarers' Happiness Index compiled by the Mission to Seafarers showed a decrease in seafarer's rating of their satisfaction levels in its latest issue in January 2020. The decline was from 6.39 / 10 in Q4 2019 to 6.3 / 10 in Q1 2020. There are many stories circulating about "the negative side of what it means to be a seafarer," she said.

InterManager

Kuba Szymanski, secretary general of the International Ship Managers Association (InterManager) said that seafarers and former seafarers working in ship management companies have a mindset of fixing problems, and have been searching hard to find ways to move crew to and from vessels in the face of changing regulations.

For example, if it was not possible to fly Polish crew home to an airport in Poland, they could be flown to Berlin and taken home by bus.

Most seafarers would not like to be anywhere else but at sea. "You spend 2-3 months at home and want to go back," he said. "That's where we belong, we belong at sea."

But at the time of the webinar there were many delays in moving seafarers to and from vessels, and the authorities were not all helpful.

The company had a graph on its website at https://www.intermanager.org/maritime-champions/ showing the number of seafarers who are due to travel and how many have managed to travel, and where they need to go, and the gap is widening. "We have to start catching up. In 3 months, it will be an even worse problem for us," he said.

At the time of the webinar, authorities in the UK and Australia were detaining ships where the crew had been onboard for longer than their contracts said, under the Port State Control regime.

This was forcing the issue, since the vessel would not be able to leave the port until the crew had been changed. But it was not necessarily helpful if the government did not also allow replacement crew onboard.

"The UK government was always very good. Throughout COVID, London and Aberdeen airports were open, we could carry out crew changes," he said. "Germany was superb, Berlin and Amsterdam were flying all the time."

But the Australian government was not facilitating crew replacements to get onto vessels. "It is very cheeky of Australia to do what they do. If I was a seafarer I would be delighted, if Australia gives a ship a yellow card, then crew would be allowed to go home from this port. But people have to understand, someone has to be allowed on to relieve."

"It isn't 'last person switch the lights off, thankyou.' I wonder what Australia would do with all those ships unmanned. They would scream because the ships might drift into their lovely waters."

Some national governments are saying that it is possible to bring in replacement seafarers, but then border control staff do not allow them through the airport.

Mr Szymanski said he had heard that Manilla airport would allow 1200 passengers a day, and not all that capacity is for seafarers. But the industry needs 40,000 seafarers from the Philippines to go out to vessels every month, and the same amount coming back.

India was also restricting Indian seafarers going out and in. In Sri Lanka, 11 former seafarers tested positive for COVID and then the government imposed restrictions.

The Panama Registry has agreed contracts can be extended by 3 months, something Mr Szymanski sees as kicking the can down the road. "Extending contracts further is not helping. I am not happy with the Panama approach."

Mr Szymanski was asked about the current situation with regulations for maximum working hours onboard.

He replied it is 10 years since the Manilla diplomatic conference held in June 2010 with updates to the STCW convention and code. At that meeting, it was surprisingly the Danish and Dutch governments pushing for a working week of up to 90 hours.

"I have no idea how long it will take before we get to 70 hours a week or 45 hours a week," he said. "Australia is working very hard. We know who the friends are. It is a political game, there's a lot of discussion behind the scenes, people trying to persuade each other."

Captain Vikram Malhotra, Anglo Eastern

Captain Vikram Malhotra, QHSE manager with Anglo Eastern Ship Management, said that it would be helpful if more administrations would treat seafarers as the 'key workers' they are, and reduce the bureaucratic hassle.

If we define a key worker as someone we need to have, then seafarers definitely fit the definition. "We need more support from the administrations to take seafarers as key workers, and allow them the same sort of privileges for travel as for the airline [staff] and others."

Many countries including the US require visas for a seafarer to get from an airport to a vessel, and consulates are shut, so people can only sign on and off vessels on ports within their own country.

"There are a few countries that permit e-visas, but not many. The administrations need to permit visa free travel for seafarers. They should permit on the seaman's book."

Some countries require seafarers to be quarantined for 14 days before they can go onboard. "That becomes another logistical issue for us."

"But on the whole we are extremely, extremely proud of how our seafarers have managed the situation, done their duties, taken their care," he said. "It is very heartening how the seafarers have taken this upon themselves. It is not in a training manual, they had invented solutions."

Nick Nash, Princess Cruises

Captain Nick Nash with Princess Cruises said that his company had the challenge of getting

crew home from 105 vessels after Covid hit, and all passenger cruises cancelled. It has spent $46m on crew repatriation so far.

It re-purposed two of its vessels as ferries, taking crew home, with crew from Philippines, Indonesia and India, sailing around the Cape of Good Hope (South Africa) to the Philippines.

There have still been challenges arranging with the authorities for the crew to leave vessels. "We've got 22 ships anchored off Manilla trying to get seafarers off. We got 16,000 crew members off, we've got 15,000 to go. Some areas have been closed off despite the IMO protocol for transfers."

There are problems relieving the technical crew, who need to be onboard when the ship has no passengers. A flight was chartered from Europe to Manilla, planned for June 20 week, but was delayed due to visa problems. It is now planned for the first week of July.

Because it is easier getting crew on and off ships in the UK, "It might have been quicker to get a ship to the UK and fly crew out of London to Manilla," he said.

There are other issues, with 22 ships "anchored in a fairly small area with squalls coming in. There are problems of trying to keep crew motivated. So it is a huge issue outside our normal routine."

Constantly changing regulatory restrictions are a problem. In one case, it had organised a charter flight to Mexico to bring in new crew, and then suddenly flights were banned.

Seafarers have a "get on with the job" way of thinking. "We didn't have a ship manual about how to deal with Covid 19. I've never seen anything like this in 44 years at sea."

On cruise ships, crew are allowed to take a guest cabin with internet and a balcony, and they have an entertainments director finding movies. There are outdoor movies in the evening which people can watch together, while keeping social distancing. "We're keeping people alive. But it doesn't make up for not being at home. It is not the best at sea."

"The worst thing is when we say to seafarers, you're getting off tomorrow, we get them to the launch [boat], they go ashore, at exorbitant prices, get to the airport, the flight is cancelled. Then they go to the ship and have to go to quarantine again. And they are nationals, they are not refugees."

In future, it should be possible to run ships with less people actually coming onboard, with more remote inspections and possibly remote pilotage, he said.

Dierdre Lane

Dierdre Lane, Chairman of The Nautical Institute Ireland Branch and Harbour Master of Dunmore East, said that as well as problems with seafarers getting home, there are problems with seafarers unable to get to a ship to start work, or worried about not being able to work.

Before they join a ship they are asked to self-isolate in a hotel for a week. "They've lost a week of leave, and it is absolutely grim, no e-mall, and food left at the door."

Once onboard, many crew feel safe from the virus in the ship's "bubble", but also have a big fear of the virus being brought onboard by a visitor. "Now is perhaps the time to look to technology to reduce ships' visits as much as possible," she said.

When stuck onboard for an extended period, they miss the "head space" that you get from having shore leave, she said.

Seafarers have the same COVID worries as everyone else, but having the worries away from family and friends.

Many companies see taking cadets (student seafarers) as a risk.

However some cadets are happy to stay longer onboard vessels, so fulfil their required number of sea months, and also considering the uncertainty about whether they can get on another ship. Some other cadets have finished the shipboard part of their course but not sure how they can do the college part, she said.

TO

WinGD's new dual fuel engine design

Engine technology company WinGD has launched a new dual fuel engine technology "intelligent Control by Exhaust Recycling" (iCER) to reduce methane slip, and other improvements for better combustion control

Maritime engine technology company WinGD of Winterthur, Switzerland, has launched a new design for a dual fuel (diesel / gas) engine, X-DF 2.0.

The engine design shows improvements in the two most important environmental aspects of engines. The methane slip [methane which is unburned in the engine and so exits into the atmosphere via the exhaust gas flow], and overall control of the combustion process, which is the pathway to improved fuel efficiency.

The methane slip is improved using the "intelligent Control by Exhaust Recycling" (iCER) technology – basically taking up to half of the exhaust gas and putting it back through the engine a second time.

It means that the overall methane emission released into the atmosphere is halved.

The engine has also been improved to gain better control over parameters like fuel admission and ignition timing, giving scope to improve efficiency in many ways.

These benefits can add up to a 3 per cent efficiency improvement in gas mode and 5 per cent in diesel mode, the company says.

The iCER is available for all X-DF engines as part of the new X-DF 2.0 design upgrade.

The X-DF engines counted over 550,000 hours operating time as of June 2020.

The company claims it has the "bestselling dual-fuel low speed engine in the maritime market since the second half of 2017" – with a 60per cent market share today in the whole DF market, based on its own data. There are currently 60 engines in operation, and more than 260 on order.

Volkmar Galke, global director, sales

Its first low speed dual fuel engine was type approved in 2015. In May 2020, the biggest engine in the portfolio, X92DF, for a large container vessel, was type approved. The smaller sister engine the X72DF based on the same concept is now "WinGD's best seller and the standard choice for LNG carriers", says Volkmar Galke, global director, sales.

The engine is "best in class" for the lowest CO2 emissions, lowest toxic emissions (NOx) as well as best in class on particle emissions, and best methane slip compared to other Otto cycle engines, says Dominik Schneiter, VP research and development with WinGD.

Many shipping companies are expecting further regulatory requirements or incentives around fuel efficiency, reducing methane slip or limiting black carbon, he says.

WinGD does not manufacture the engines itself, but licenses the designs to manufacturing companies, including in China, South Korea and Japan.

Since 2016 the company has been 100 per cent owned by China State Shipbuilding Corporation (CSSC). It was formerly the low speed, two stroke engine division of Wärtsilä but spun out as a separate company in 2015.

The company claims to have 90 per cent market share of engines for vessels in the LNG carrier sector, 100 per cent of all LNG vessels being built in 2020 up to the time of writing (August 2020), and 60 per cent market share for all dual fuel vessels. These are the vessels most likely to want to use gas as fuel. It expects to see a number of LNG newbuilding contracts coming shortly.

Another part of the market is shipowners with other types of vessels who are looking at LNG as a fuel, including container vessel operators, and now the first tankers. It has developed ways to incorporate VOC gas (from the cargo) mixed with the LNG and burned in the engine.

Path to low carbon

The company sees the engine as a way for companies to maintain flexibility as new fuels come into operation. Due to the actual bunker market they may use diesel now, but can move to bio diesel or LNG fuel when it becomes available, and move to synthetic LNG (produced from renewable fuel) or bio-derived LNG (from rotting biomatter) as it becomes available.

Dominik Schneiter, VP research and development

But while LNG may be a bridging fuel to zero carbon LNG, we may see zero carbon liquid fuels being introduced meanwhile. The company cites DNV GL data predicting that use of ammonia might begin in 2037, forming a sizeable chunk of maritime fuel by 2050, as a liquid fuel replacing diesel.

As an engine designer, WinGD sees its role having technology ready for whatever fuels shipowners may be using and making sure the technology is ready in time.

Each fuel has different burning principles, which the engine will need to be tuned to.

The combustion process of the engines has been tested out with new fuels with a lower flash point (temperature at which they form an ignitable mixture) like ethanol and methanol. "Ones available low flashpoint fuel injection systems and respective engine upgrades would be applicable for newbuildings first but should be made available for retrofitting too," said Volkmar Galke, global director, sales.

The company does not anticipate any change to the 2-stroke engine (such as a move to electric motors to drive propellers) as the main ship engine "for a long time". But it anticipates an energy mix to move into the engine room making the set up more complex.

"The journey to 2050 requires experts to come together. WinGD is open to embrace this journey and collaborates with as many stakeholders as possible," he says.

Adjustable combustion

Despite not implemented into the serial

design yet, the engine has the capability to vary the ratio between combustion chamber and piston stroke, known as the 'compression ratio', while the engine is in operation. This makes it possible to run the engine at the best fuel efficiency while the operating mode between Otto and Diesel as well the load on it changes. The method is known as Variable Compression Ratio (VCR).

For instance, in Otto mode, higher engine load benefits from a lower compression ratio allowing to reach more power, but lower engine loads benefit from higher ratios because there is lower fuel consumption.

iCER also has capability to adjust the gas / air mixture. If Otto combustion moves away from the 'rich limit' – so has less fuel that might ignite, there is a slightly slower combustion speed, and less tendency for early ignition.

If diesel combustion is slowed down, you have a reduced peak pressure (from the combustion) and temperature, and form less NOx, but also a little less efficiency.

"Depending on your gas / air amount – you can nicely control combustion speed – and also avoid early ignition," says Mr Schneiter. "So, you are much more in control of your combustion."

CO2

The engine reduces the reactivity of the gas-air mixture by replacing oxygen in the suction air by CO2.

This provides additional options for optimising engine performance.

The engine is normally operated at an air fuel ratio of 2.5. If you have more fuel, you have risks of self-ignition, but if you have more air, you risk combustion instability, so you need to stick in this operating window. But by using CO2, you can use more air (less fuel) in the mix if you want to. This gives you freedom to optimise the engine for lower consumption, when the load requirement is lower, without any compromise on the maximum power output you can get (the maximum fuel concentration).

The iCER system is replacing oxygen in the combustion with CO2 by default.

Exhaust gas recycling

As mentioned above, the exhaust gas recycling takes half of the exhaust gas and puts it back through the engine another time. It means that the overall methane slip is halved.

It is not possible to completely eliminate methane slip with an Otto cycle engine, so recirculating the exhaust gas back through the engine may be the best idea, "giving the methane a second chance to burn," Mr Schneiter says.

The exhaust gas needs to be cooled before it can be recycled – a cascade cooler is used, with no direct contact between the gas and the cooling water.

Any 'bleed water' can be discharged without any extra water treatment – because the system is only operated when in gas mode. There is no soot or sulphur from gas. This keeps the water treatment system very simple.

The amount of exhaust gas is controlled by a back-pressure valve, which releases exhaust gas into the cooler – so there is no need for an exhaust gas blower, he said. This also reduces power consumption.

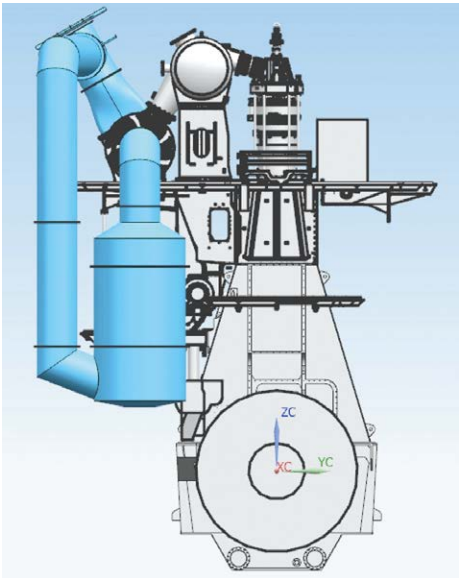
You can use an exhaust gas economizer additionally (such as one made by Alfa Laval) which take otherwise wasted heat from the exhaust and use it to make steam (if steam is required).

Diesel and Otto cycle

The company claims to be the only 2 stroke engine design which can operate on both the diffusion (diesel) and pre-mixed (Otto /gas) cycle.

With the Otto cycle, the fuel is ignited by pilot fuel. Pilot fuel is pre-mixed with air before entering the engine.

In diesel engines, fuel is injected into the engine cylinder near the end of the compression stroke. During a phase known as ignition delay, the fuel spray atomizes into small droplets, vaporizes, and mixes with air,



before being ignited.

Whether fuel is burned in a diesel cycle or the Otto cycle can depend on the situation and load required.

WinGD is also developing a combustion cycle which is a mixture of both, using LNG mixed with diesel, which it calls fuel sharing – providing a new degree of engine optimisation.

Research

At the time of writing (June 2020), the X-DF 2.0 engine technology was in its final stages of 2 years of trials at a test engine facility operated by WinGD.

WinGD has test infrastructure with five test engines, and test rigs to test combustion of individual fuels. It also runs computer simulation models alongside them.

The company has been putting most of its research energies into developing better lean burning combustion on a 2-stroke engine but taking a conservative approach to ensure reliable operation.

All the new engine technologies need to be carefully checked, to avoid the risk that they impact the reliability of the engine.

It is trying one method after another and plans to continue doing so for the decades to come, says Mr Schneiter.

Silverstream – increased interest in bubbles under the hull

Silverstream reports a growing interest in its technology which injects air bubbles into the boundary layer between a vessel's hull and the water, to reduce frictional resistance and in turn reduce fuel consumption

Silverstream Technologies, based in London, reports that it has received "a lot of orders" over Spring 2020 for its technology, which injects air bubbles into the boundary layer between a vessel's hull and the water, reducing frictional resistance.

The bubbles are sent from beneath the vessel's bow (front), so the whole vessel can ride over them. It has been described as an "air carpet".

For tankers, it can typically achieve 7-8 per cent savings in deep draft and 10-11 per cent in shallow draft, the company says.

When the vessel is laden and in deep draft, the bubbles have a smaller effect as a percentage of all fuel use. But the fuel saving in monetary terms can be higher, because more fuel is being used.

As a rough estimate, the technology will pay back within 2-4 years, says Noah Silberschmidt, founder and CEO. But there are many factors affecting this.

The 2-4 years is based on the vessel steaming for a large proportion of its operational time, and based on an oil price of around $50. Tankers are typically steaming 250 days a year, LNG carriers around 300 days a year at high speed.

The costs will be different if the technology is fitted when the vessel is being built, or if it is retrofitted later. The bigger the fuel consumption, the faster the payback.

"We are addressing the segment with big fuel spends," Mr Silberschmidt says.

Silversteam offers shipping companies an engineering study for about £100,000, where it will assess in detail how much savings its technology could achieve for a specific vessel and what the payback time would be. This fee is deducted from the price of a system, should it be ordered.

Such studies are underway "with a variety of oil and gas majors, and the leader in container shipping, the leader in cruise shipping, the leader of an ore business, and LNG vessel owners," he says.

The company is hiring another 10 people.

How it works

The technology works best with big flat bottomed vessels, with at least 20 per cent of the area of the submerged part of the hull consisting of flat bottom.

Tankers typically have 40 per cent of their submerged hull area flat, cruise ships typically 25 to 28 per cent, Mr Silberschmidt says.

Larger flat bottomed vessels can see 8 to 10 per cent net fuel saving from the system.

The system's generators require power to run, so Silverstream quotes net savings rather than the higher gross potential.

As a different way to understand the fuel costs and benefits, a vessel with 40 per cent of its total submerged hull flat bottomed will typically use 25 to 30 per cent of its propulsion power overcoming frictional resistance, and the air bubble system can halve the amount of frictional resistance.

The fuel saving can be immediately verified, just by switching it on and off. When switching it on you see an immediate drop in shaft power, followed by an increase in speed, he says.

The air bubbles are sent out from an air release unit, or recess, created at the fore (front) of a vessel's hull. You might need 8-10 air release units for a small vessel, 16-18 for a VLCC, or 22 for a 22,000 TEU container ship.

The number required depends on the width of the vessel not the length, because the air bubbles flow under the whole length of the ship.

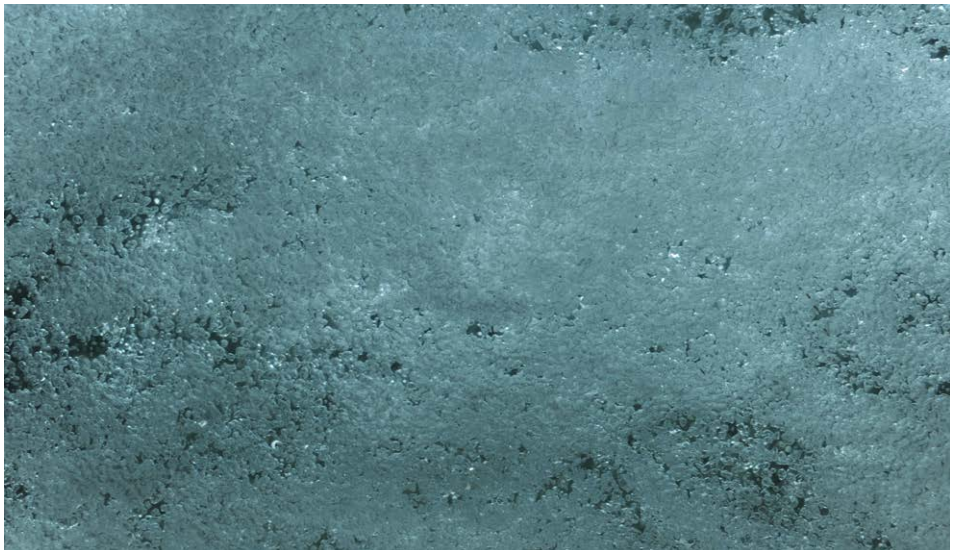
Some space is needed on the vessel to install the compressors. This is generally easier to find on merchant vessels than cruise ships, he says.

The technology works independently of weather conditions.

The additional cost of installing the technology can be very low if it is planned as part of the vessel design before it is built. "Just a few more pipes and a few more cables," he says.

On a newbuild vessel, the technology could be fully integrated into the propulsion chain, so customers would specify "a propulsion system together with air lubrication".

For a retrofit, the work requires installing the air release units under the hull, which is a major



Close up of micro bubbles under a ship's hull

work package, involving dry dock. The work on MR1 tanker "MT Amalienborg" took 14 days.

Getting support behind the technology

For a shipowner to invest in the technology, they are likely to want to have a clear idea of the savings. They need to find a shipyard that can build it, and see support or commitments from charterers, he says.

"The owner needs to be comfortable they are able to maintain and service it, the yard needs to be comfortable they can accomplish what is needed, the charterer wants to know how much he is going to save."

Investors, including pension funds, are another factor. They are increasingly concerned about ESG and "don't want to invest in companies that are not trying their hardest," he says.

The technology would have relevance even in an era with vessels running on zero CO2 energy, such as ammonia or batteries, because of the savings in propulsion costs - with zero CO2 energy likely to cost far more than conventional fuels.

Trials and orders

The company started a sea trial with Shell in 2014, including with a Shell funded retrofit on a MR1 tanker, MT Amalienborg, owned by the leading Danish Shipping company Dannebrog Rederi.

The trials verified by the Lloyds Register Ship Performance Team showed net [fuel savings minus additional energy costs] average energy efficiency savings of 4.3 per cent and 3.8 per cent for the vessel in ballast and laden conditions respectively. The retrofit took 14 days to complete. The tests were made under a series of 52 single runs under ballast load conditions (6.9m draught)

A subsequent laden condition trial conducted on a constant heading (at 10.6m draught) was completed six months later, due to operational restrictions.

The trials procedure for both was specified by Lloyd's Register.

This led to the first commercial order with Norwegian Cruise Lines in 2015. It was a commercial new build vessel, Norwegian Joy, at the time one of the largest cruise vessels in the world.

In 2017 the system was retrofitted on Carnival Corporation's Diamond Princess. This system is now used all the time when the vessel is in propulsion, except when it is manoeuvring into port, he says.

In 2018 it signed a deal with Grimaldi Group for the system to be installed on 12 ro-ro vessels, anticipated to be the "cleanest, most pioneering in their class". These are being built at Jinling shipyard in Nanjin, China, with the first already commissioned.

Silverstream has a framework agreement to fit an unspecified number of LNG carriers in Shell's fleet. It also has a license agreement with maritime power company Wärtsilä, which plans to offer the system to customers integrated with its propulsion solutions.

The company

Noah Silberschmidt founded the company in 2010. He previously worked in investment banking, including the role of managing director at Bank of America Merrill Lynch from 2007 to 2010, and started out in the supply and trading department of Shell from 1992 to 1994.

The company provides shipping companies with a package of engineering work and equipment ready to be implemented, as well as a license to use the technology and design.

The system includes the air release units, the compressors, an automation system, piping and cables. Silverstream does not directly supervise the implementation.

The company defines itself as an "IP and design company". It has "9 families of patent in 40 different jurisdictions," he says.

The technology is also available through Wärtsilä. Wärtsilä offers service agreements, so any customer has access to Wärtsilä's engineering staff around the world.

There are framework agreements with 3 large engineering companies – including Houlder Ltd, a UK marine engineering and technical consultancy firm. Silverstream is collaborating with Houlder on design and integration procedures for both newbuild and retrofit installations of the system.

Another joint development agreement with shipyard SWS (Shanghai Waigaoqiao Ship Building Co Ltd) was announced at Marintec, China, in December 2019.

The company reports that it has recently doubled its staff count to 22 people, and is currently recruiting for 15 further staff mainly in technical roles.

Global Industry Alliance

Silverstream is also part of an organisation called Global Industry Alliance. It is described as "a new public-private partnership initiative of the IMO under the framework of the GEF-UNDP-IMO GloMEEP Project that aims to bring together maritime industry leaders to support an energy efficient and low carbon maritime transport system."

Members include vessel operators Maersk, Grimaldi, MSC, Royal Caribbean, Shell, Stena; engineering and equipment companies ABB, Ricardo, Silverstream and Wärtsilä; class societies Bureau Veritas, DNV GL and Lloyd's Register; and a mix of others - Total Marine Fuels, Marine Traffic, Panama Canal Authority and the Port of Rotterdam.

Noah Silberschmidt, founder and CEO

"We try to figure out how to best affect public and private [activities] to make changes in how things are done," Mr Silberschmidt says.

For example one project is working out the best way to run a sea trial and validate vessel performance technologies.

There are many technologies which only provide savings of under 3 per cent – and gathering evidence for small savings can be very hard, he said.

Ensuring real savings

Air lubrication for vessels is a 160 year old idea, first suggested in 1860 by English engineer William Froude, who also worked with Brunel on the Bristol to Exeter railway. There were a number of further attempts at air lubrication in the 20th century.

But the systems all ended up requiring too much energy to operate. If the

amount of energy required to squeeze bubbles of air out of the hull is more than the system saves, it has no value.

So the technology innovation from Silverstream can be more precisely defined as finding a way to do air lubrication of vessels with a low energy consumption from the system itself.

Today, a number of yards are starting to say they offer air lubrication systems, but "to my knowledge there's no third party proof," he says.

"We are very open about who is testing the technology and how we are doing it."

Mr Silberschmidt says he would be happy for the Silverstream solution to be tested directly against other air lubrication systems, so the market can see which is better.

Stena Bulk's wind + solar tanker

Stena Bulk has designed a product and chemical tanker using wind and solar power, "IMOFlexMAX"

It estimates that the vessel will be able to reduce CO2 emissions by at least 25 per cent, "with a potential to reach up to 45 per cent" compared to a modern product tanker on low sulphur fuel oil.

It has been designed by naval architects at sister company Stena Teknik and is based on 40 years of tanker shipping experience.

The wind driven propulsion comes from Flettner motors. These are cylinders which are spun along their long axis (driven by electricity or connection to the ship's engine).

The propulsion force comes as air passes across the cylinder, due to the "Magnus effect," the force generated by fluid flow over a rotating body.

The ships are also equipped with solar panels.

They are powered by dual fuel engines, running on both LNG and low sulphur liquid fuels.

The design builds on experience with Stena's "IMOIIMAX" vessel design, which has improvements to the "hull lines", engines and propeller, to create a design for what the company believes is "the most energy efficient ECO MR tanker existing today". It has auxiliary engines optimised for part load operation (rather than being optimised for high load operation, which is usual). It has two separate boilers for heated cargoes. When less heat is required, it can be more efficient to have one smaller boiler at full capacity than a large boiler at half capacity.

The vessel is also able to recover heat from exhaust gas.

It uses nitrogen instead of flue gas for inerting tanks, which the company says is more fuel efficient, as well as making for easier cleaning.

13 IMOIIMAX MR tankers were in operation as of January 2020.

"The plan is for the IMOFlexMAX vessels to be deployed in Stena Bulk's logistics system in the global market along with the IMOIIMAX," says Erik Hånell, president and CEO of Stena Bulk.

"IMOFlexMAX vessels will constitute an important asset for Stena Bulk, as well as for its partners, in strengthening our position as the market-leading, cross-trading specialists in the MR segment with increased efficiency and reduction of greenhouse gases."

"The prototype is one step further in Stena Bulk's vision of being our customers' first choice for safety, innovation and performance in the transportation of oil, chemicals and gas." TO

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UV on fore peak tank ballast systems

Some tanker operators are requesting a standalone ballast water treatment system for their fore peak tank (a tank used to adjust the vessel's trim), says BIO-UV Group

Some tanker customers have been fitting two separate ballast water systems. A large explosion proof system for main use, and a smaller additional system for handling ballast water from the fore peak tank, which is not connected to the main ballast tanks, said Xavier Deval, business director for the BIO-SEA product at BIO-UV Group.

The fore peak tank is a ballast tank at the fore of the vessel, which is filled and emptied to adjust the trim of the ship.

In this case, the company's BIO-SEA B or L range are very compact and can treat up to 120 m3/h. Both are suitable for treating water in the peak ballast tank, he says.

Some chemical tanker operators have been asking for smaller systems which can handle 200 to 300m3 / hour flow rates.

The BIO-SEA B system combines mechanical filtration and ultraviolet disinfection in one unit. It can handle flow rates up to 13m3/h up to 2000m3/h.

It can be made available in modules or on two 'skids' to be easy to install.

Each system is made up of a number of "UV reactors with the L range capable of 30m3/h per reactor and 150 m3/h for the B range. This is from only one lamp inside, made from bronze, aluminium and titanium.

It also makes a unit for smaller vessels such as yachts, called BIO-SEA Small Flow Rate.

There are sensors on the system which judge the water quality and adjust the lamp power accordingly, since more light power is needed to penetrate dirtier water.

The system is not explosion proof, so cannot be installed on the deck of tankers.

About BIO-UV group

Bio-UV Group is based near Montpellier, France, and specialises in a range of UV equipment for industrial purposes, as its core business. Other than maritime, applications include pharmaceutical water, waste water and swimming pools.

It has been involved in the maritime ballast water sector since 2011. It has over 200 ballast water systems in operation on ships today, and 80,000 UV systems in use.

When companies started considering ballast water systems around 2012, there was a strong preference to go to companies with marine backgrounds, Mr Deval says. But there is a strong argument for working with companies which have deep expertise and a network of service agents specialising in UV.

"We have the expertise and the technology to design the most adaptive reactor," he says.

The company has a network of service xqbeen trained in its headquarters in France, before doing a real commissioning.

All assembly is done in the South of France, including welding system engineering, system assembly, cable wiring and full testing with Classifications societies

You typically need higher UV doses for maritime ballast water than you do for systems for drinking water and swimming pools, Mr Deval says.

There is also the challenge that the dirtiness of water carried by ships varies. Companies need a system which can handle the worst water they may need to treat. But the basic technology of water UV treatment is the same for all applications, he says.

Viruses

The company has also been developing UV lamps for a different application – killing coronavirus.

It has a portable handheld UV virus killer available priced at between Eur 2000 and 3000, depending on system reference and which would be suitable for ships, including for use on desks, ship's bridges, and bedrooms, Mr Deval says.

The system has been approved by French standards organisation AFNOR and two further independent laboratories, as safe for killing many bacteria and viruses, including COVID 19, with 99,99% effectiveness on viruses and 99,999% on bacteria.

. It can be 100 times more effective than using sanitiser or wipes, he says, and also much faster.

A number of units have been sold to the cruise sector, merchant shipping sector and navy.

One way around this is to have a robot device for applying the UV. The company is developing such a device, to be available in August 2020, which could sanitise a whole room on a vessel within several minutes without a person being present.

TO

Using shaft generators instead of separate generators

Shipping companies can generate power onboard from the main propeller shaft, rather than having a separate generator. This can be more efficient because you draw exactly what you need, a two-stroke main engine has better fuel economy and you can use cheaper fuel. We asked Yaskawa Environmental Energy / The Switch how their system works.

Conventionally, ships have an engine to drive the propeller, and a separate generator, running on diesel, to generate power for the ship.

But a more efficient way to do it can be to use the shaft itself to generate power as well as drive the propeller. Instead of having a separate generator running continuously, generating the same amount of power, you draw the energy from the shaft that you need. Plus, the two-stroke main engine has better fuel economy and allows you to use cheaper fuel.

Yaskawa Environmental Energy / The Switch, a company based in Helsinki and a subsidiary of Yaskawa Electric Corporation in Japan, provides permanent magnet (PM) shaft generators and associated electrical equipment.

The payback time is usually only few years, with a reduction in fuel consumption for power and a reduction in maintenance costs on power generation systems of 10–20 per cent.

Systems are from 700 kW to 20 MW, although about 2 MW is more typical. One of the biggest systems delivered was for a large container ship with a big need for power for its cooling containers. Tankers typically need most electrical power for pumps, and they are not running all the time, so can be served with a much smaller generator plus a battery.

By comparison, a large vessel may have propulsion power of 80 MW.

In the tanker sector, Yaskawa Environmental Energy has PM shaft generators installed on vessels including Saga LNG, Terntank, Rederiet Stenersen and Ektank. Over 40 of its PM shaft generators are currently sailing on vessels.

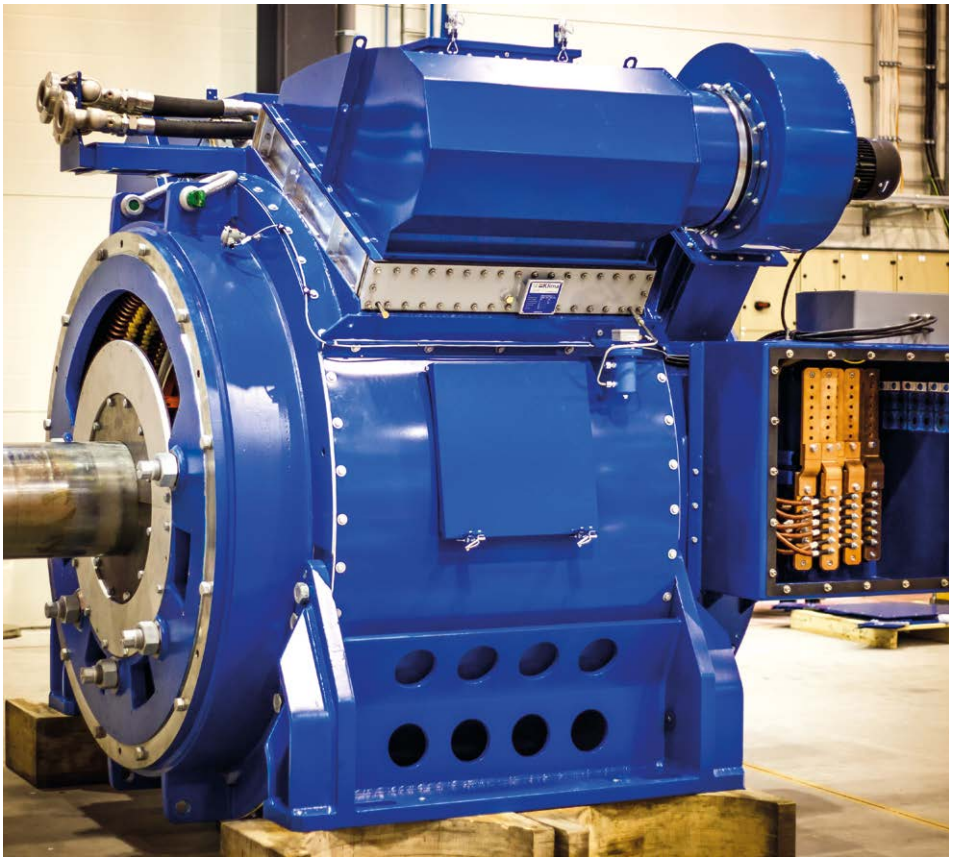
The company has a contract with Caterpillar, which is integrating PM machines for propulsion and auxiliary gensets together with a state-of-the-art DC-Hub solution for bulk carriers. “We’re also in the process of signing contracts with several LNG carriers,” says Ville Parpala, Director of Product Marketing, Marine Business at Yaskawa Environmental Energy / The Switch.

Another recent installation was on the dynamically positioned supply vessel North Sea Giant. It had 6 separate generators onboard, three of which were for back-up. One genset was replaced with batteries and The Switch DC-Hub system. After installation, the vessel now uses only one diesel generator with batteries instead of running all three generators at the same time. Fuel savings have been enormous.

The PM shaft generators are made in Finland, and the electrical DC-Hubs are built in Norway.

How it works

The permanent magnet shaft generator is



The Switch Shaft Generator

fitted in-line on the shaft – so as the shaft rotates, it rotates the generator. The shaft generator requires that the shaft has two sections, so one can be bolted to each side of the generator.

The generator draws off a small amount of the shaft's power in doing so – but an amount so small the propulsion system will barely notice, because the amount of energy needed to propel the vessel is so many times more than the power demands from shipboard equipment and services.

The power delivered by the shaft generator can be adjusted electronically with the frequency converter, and reduced to zero if necessary. In contrast, a standalone generator will normally have little adjustment potential, being either on or off.

This means that no gearbox is required, which would be additional equipment to purchase and maintain.

The generator power can charge up batteries or be used directly onboard.

If it charges up batteries, then it can be run in reverse, with the batteries turning the shaft. This would not provide a similar level of power to the main engine, but could offer enough power for vessel manoeuvres in port, for example. This may offer further benefits in a future where vessels are asked not to burn any fuel at all in port.

It can also provide a limited amount of propulsion power if the main engine fails, something the company calls "Take Me Home" operational mode. You can achieve around 30 per cent of normal speed this way, for a limited time period.

The systems are custom built by Yaskawa

Ville Parpala, Director of Product Marketing, Marine Business at Yaskawa Environmental Energy / The Switch

Environmental Energy / The Switch, so can be designed to fit into the space which the vessel has available for it.

The machines use 'permanent magnets' for generation, which are like fridge magnets, rather than electromagnets. These do not need any electricity to start them up, which simplifies the system requirements.

The magnet material, called Neodymium-Iron-Boron, is the strongest type of permanent magnet available commercially.

Permanent magnet generators are typically 2–4 per cent more efficient at full load, and 10 per cent more efficient at part loads, than conventional electromagnet machines, due to avoiding current losses in the rotor.

The company provides a range of power electronics to go with the system, including frequency converters for controlling the speed of rotating machines or adjusting the power to ship consumers and allowing the use of green power, such as batteries, solar panels or other sources.

Dual windings increase redundancy and allow the use of two separate converters.

If there is any malfunction in the shaft generator, mechanically disconnecting the shaft generator from the propeller shaft is a fairly simple task, which takes about 15 minutes.

The costs of barnacles on your hull

Barnacles only attach to a ship when it is idle, and many vessels have been idle for considerable periods this spring, being used for oil storage, or delayed in transit. One study says 10 per cent barnacle cover can increase fuel consumption by 36 per cent

By Per Svensson, sales director, I-Tech AB

Barnacles only attach when a ship is idle.

Tankers sat at anchor operating as off-shore storage, predominantly in coastal regions with high biofouling potential, could now have significant barnacle fouling coverage on the hull compared to when they were in active service pre-pandemic.

A ship hull that has accumulated biological organisms (commonly known as biofouling), particularly one that is covered by shell-forming creatures such as barnacles, experiences increased hydrodynamic drag as it moves through the water.

This means that the greater the coverage of biofouling on the hull surface, the greater the shaft power required for the ship to maintain the same speed through water and this converts directly into increased fuel use.

Or if a ship is operating on fixed shaft power, it will suffer speed losses.

Given the pattern of idling tankers being used as floating storage, we can make an assumption that this is a vessel type that is particularly at risk from barnacle fouling.

The greatest concentration of biofouling creatures are found in the warmer waters of the tropics and sub-tropics, with these areas being fondly referred to a 'biofouling hotspots' or 'barnacle paradise'. Since the 1990s, a shift in global trade has resulted in ships visiting ports in tropical and sub-tropical waters.

Per Svensson, sales director, I-Tech AB

How much fouling is there?

A 2007 published study by Michael. P. Schultz found that a vessel with 10 per cent barnacle coverage would need a 36 per cent shaft power increase to maintain the same speed.

Although this particular study was based on a naval frigate, the statistics are relatable to cargo ships.

A new research study commissioned by I-Tech AB by marine coating consultants Safinah Group found that over 40 per cent of vessels surveyed had a barnacle fouling coverage of over 10 per cent.

This data comes from dry dock inspections of 249 vessels analysed between 2015 and 2019 (some vessels had multiple inspections in that period).

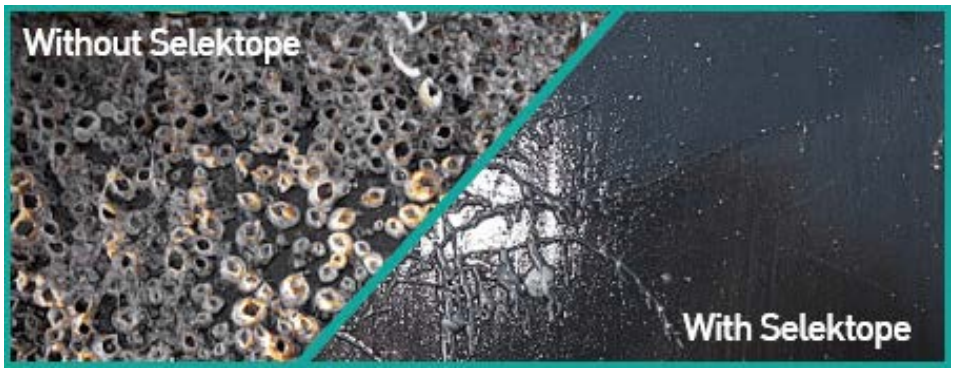
By examining the type of vessel, existing antifouling coating used, barnacle coverage and location of the barnacle fouling, the research study builds a comprehensive picture of the extent of the barnacle fouling issue faced by the global fleet.

On 44% of vessels surveyed, over 10% of the underwater hull surface was covered with hard fouling. Anything more than 10% coverage is deemed to cause an 'unacceptable' impact on vessel performance by experts.

The data showed that 124 vessels had barnacle fouling coverage of up to 1000m2, 29 had coverage of up to 2000m2 and 19 vessels had had coverage up to 3000m2.

Two vessels had significant barnacle fouling coverage between 11,000 and 12,000m2.

Extrapolating from published data taken from another 2011 study by Michael P. Schultz, this level of hard fouling could be



responsible for at least 110 million tonnes of excess carbon emissions, and an additional US $6 billion spent on fuel per year for the global commercial fleet.

This calculation is based on today's relatively low fuel prices and only assumes a 10% coverage of hard fouling.

When looking at the breakdown of fouling by vessel type, it was found that across vessels with relatively lower activity, the frequency of barnacle fouling was greater.

On lower activity vessels, it was found that 45% of vessels had barnacle fouling coverage greater than 10% compared to just 27% observed across higher activity vessels.

Drydocking data analysed as part of this study was completed pre-pandemic.

Therefore, it can be assumed that if 2020 data was to be assessed at a later date, the percentage of barnacle fouling on the hull would be much higher due to the increase in idling vessels this year so far.

Barnacles on a hull

Selektope

Selektope, an antifouling coating ingredient technology developed by I-Tech, has witnessed significant uptake in the past five years since first launched.

Selektope is an organic, non-metal ingredient for marine coatings that is relatively unique compared to traditional biocides currently used in many marine paints.

When leached into the water from the antifouling coating, functioning like any other biocide, Selektope activates the swimming behaviour of barnacle larvae through natural receptor stimulation.

This induces the barnacle larvae's swimming behaviour that they use when seeking a hard substrate on which to attach.

This constant swimming mode prevents them from being able to settle, forces them to find another hard surface on which to glue themselves and build their volcano-shaped shell.

The barnacle larvae are only affected while they are close to the coated surface and the exposure to Selektope ultimately leaves them unharmed.

When used in antifouling paints, Selektope can protect all ship types when they are idle or operating at low speeds for extended periods, even in extreme barnacle fouling risk areas.

Out of the top six marine coatings manufacturers, three have commercialised products containing Selektope in the past five years: Chugoku Marine Paints, Hempel and Jotun.

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